

Rapid AI Development Cycle for the Coronavirus (COVID-19) Pandemic: Initial Results for Automated Detection & Patient Monitoring using Deep Learning CT Image Analysis

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Abstract

Purpose: Develop AI-based automated CT image analysis tools for detection, quantification, and tracking of Coronavirus; demonstrate they can differentiate coronavirus patients from non-patients. **Materials and Methods:** Multiple international datasets, including from Chinese disease-infected areas were included. We present a system that utilizes robust 2D and 3D deep learning models, modifying and adapting existing AI models and combining them with clinical understanding. We conducted multiple retrospective experiments to analyze the performance of the system in the detection of suspected COVID-19 thoracic CT features and to evaluate evolution of the disease in each patient over time using a 3D volume review, generating a Corona score. The study includes a testing set of 157 international patients (China and U.S). **Results:** Classification results for Coronavirus vs Non-coronavirus cases per thoracic CT studies were 0.996 AUC (95%CI: 0.989-1.00) ; on datasets of Chinese control and infected patients. Possible working point: 98.2% sensitivity, 92.2% specificity. For time analysis of Coronavirus patients, the system output enables quantitative measurements for smaller opacities (volume, diameter) and visualization of the larger opacities in a slice-based heat map or a 3D volume display. Our suggested Corona score measures the progression of disease over time. **Conclusion:** This initial study, which is currently being expanded to a larger population, demonstrated that rapidly developed AI-based image analysis can achieve high accuracy in detection of Coronavirus as well as quantification and tracking of disease burden.